

# EFFECTS OF UNDERSTORY FIRE MANAGEMENT TREATMENTS ON CALIFORNIA HAZELNUT, AND ECOCULTURAL RESOURCE OF THE KARUK AND YUROC INDIANS IN THE PACIFIC NORTHWEST

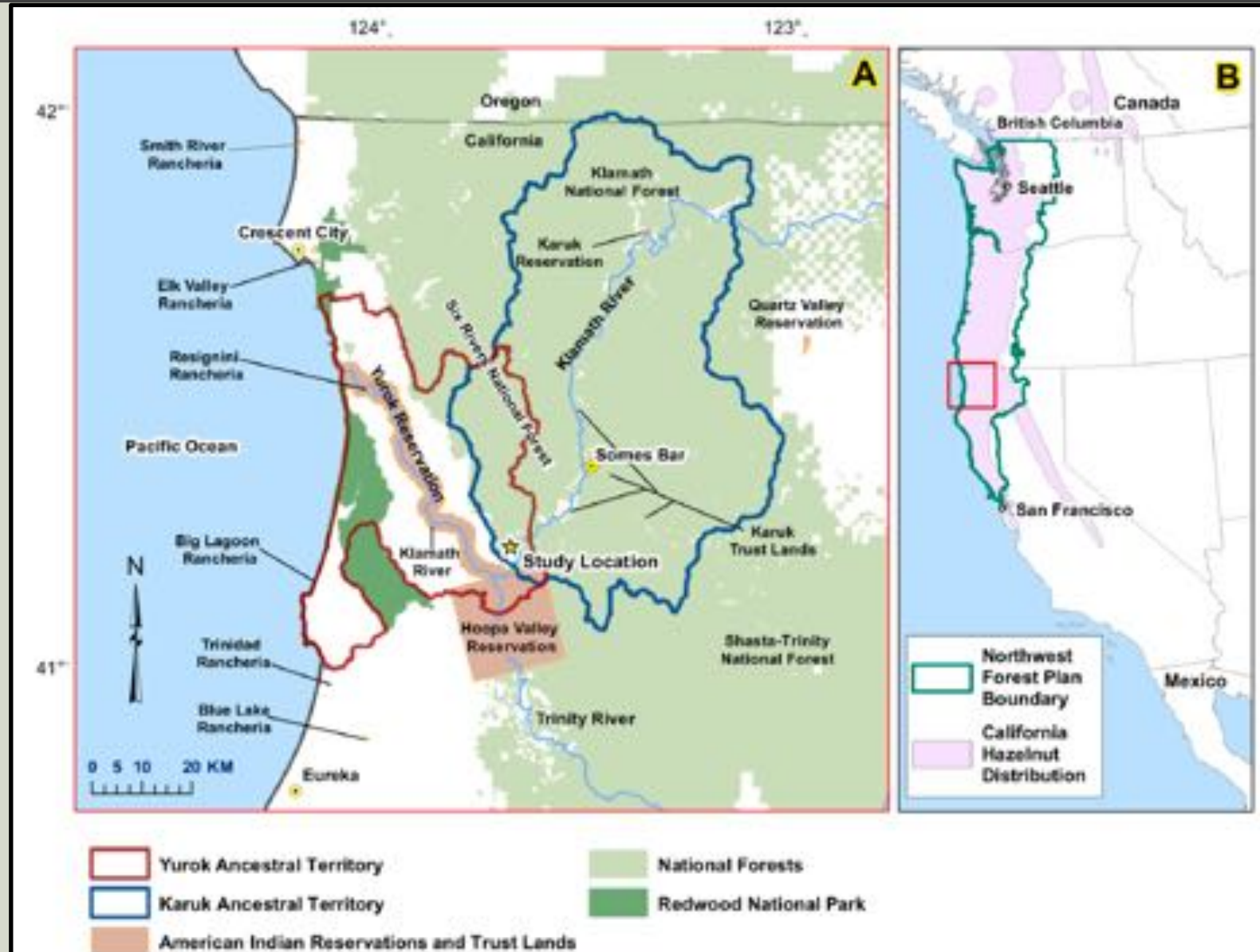
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\*The findings and conclusions in this presentation are those of the authors and should not be construed to represent any official USDA or U.S. Government determination of policy, nor of those of the university, tribes or tribal organizations



## STUDY LOCATION AND TRIBAL TERRITORIES: NORTHWESTERN CALIFORNIA-WESTERN KLAMATH MOUNTAINS/RIVER

- Study was conducted in an area of mutual interest between the aboriginal territories of the Karuk and Yurok Tribes of the mid-lower Klamath River region of Northwestern California.
- The project location was on private property, near homes and along a main mountain road system.
- The study was conducted with private landowner [Cooper Ranch], a founder or the Orleans-Somes Bar Fire Safe Council, Karuk Indigenous Basketweavers, US Forest Service, and Stanford University (now CSU-East Bay).



# WHY WAS THE RESEARCH CONDUCTED?: TRIBAL SCIENCE SUPPORT AND RESEARCH INTEREST OF SURROGATE TREATMENTS FOR ENHANCING HAZEL BASKETRY STEM PRODUCTION

- **Challenges:**

- Traditional Ecological Knowledge (TEK): Evaluation of Season of burn and treatment type effectiveness Q: How can TEK be incorporated in study?
- Scope of inference-geographic area: Pilot project-one location
- Variables of interest to study: Hazel stem response to treatments, Canopy closure/light, stem-shoot production as affected by treatment types

- **Opportunities:**

- Evaluate TEK for season of burn: Spring vs. Fall
- Multiple participants involved; Collaborative research
- Successful pilot project: Guiding landscape restoration at larger landscapes for hazel basketry production
- Tribal community-based template: Collaborative research to inform management and for policy development

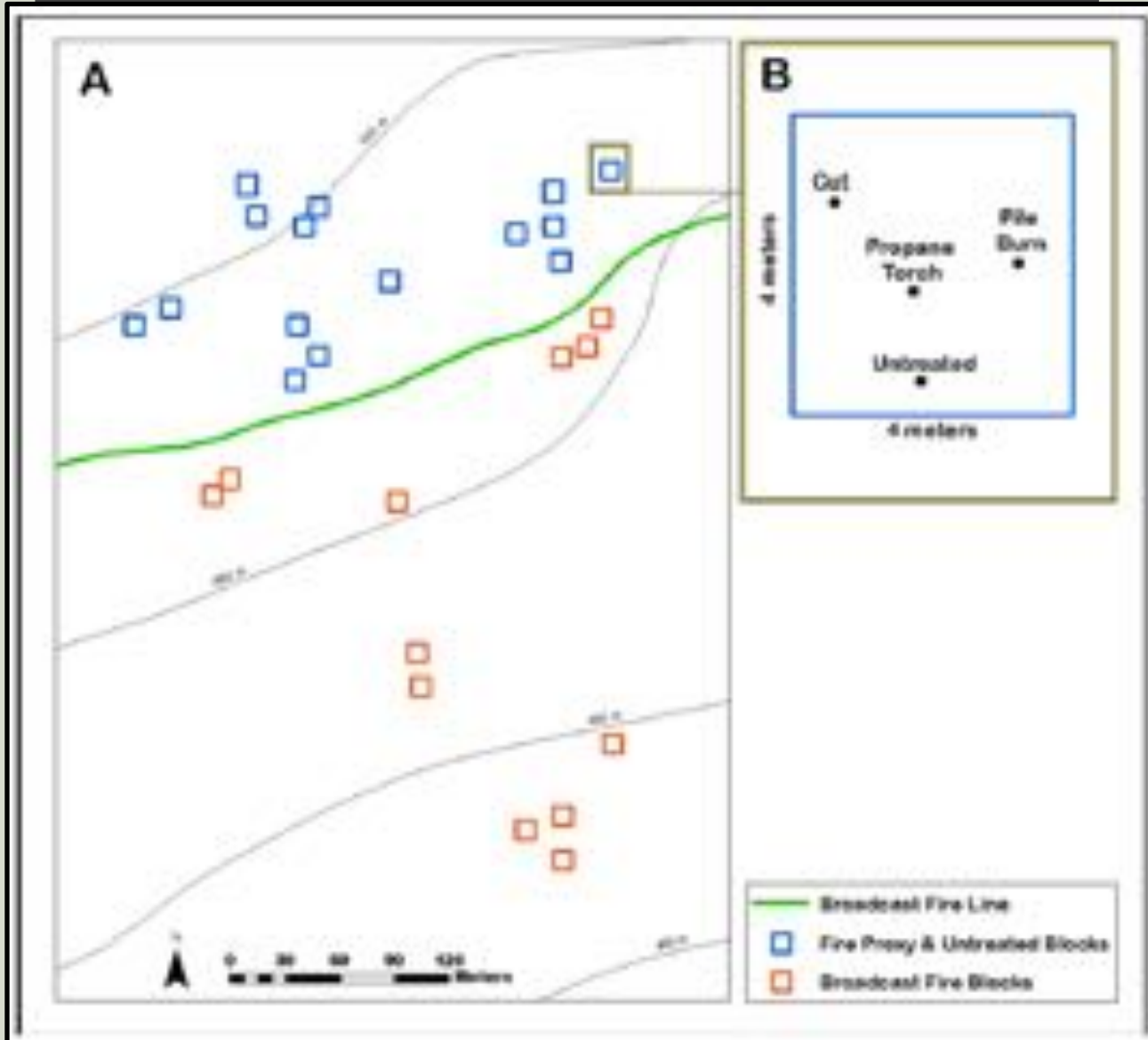


# CALIFORNIA HAZEL: GROWTH FORM AND CANOPY CLOSURE

- Objective: Compare hazel growth form between multiple treatments
- Treatments: Cutting, Pile-burn, Propane torch burn, Control/Untreated
- Measurements: Hazel shrub height, # of stems, # of useable basketry stems [tribal criteria used] Canopy closure/light above shrubs, growth response to season of treatment/burning



# STUDY DESIGN AND TREATMENT APPROACH



Cutting, Pile burning, Propane torch burning, and Untreated



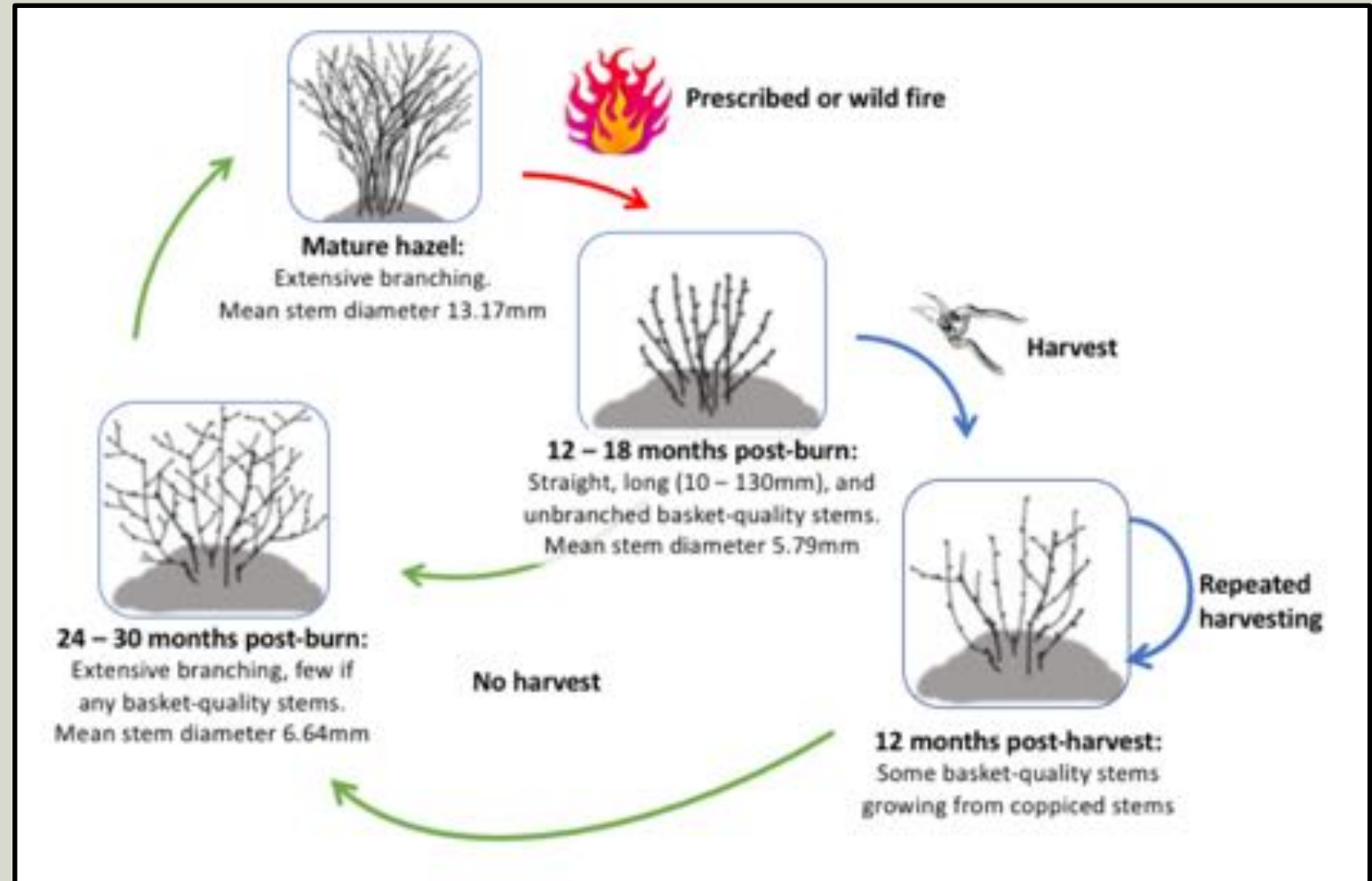
## HAZEL: BURNING ALSO IMPROVED NUT PRODUCTION AND DECREASED PESTS

- Tribal (TEK) and ethnographic information detail different seasons of burning hazel shrubs for basketry and nut/food production.
- Basketry vs. Nut management depends on the habitat [more closed forest vs. open oak woodland] related to sunlight conditions.
- Ecotones or more open forest settings with mixed light regimes (diversified canopy among over story trees and types of trees- proportion of conifer to evergreen and deciduous hardwoods) can foster basketry stems-shoots and subsequent nut production.



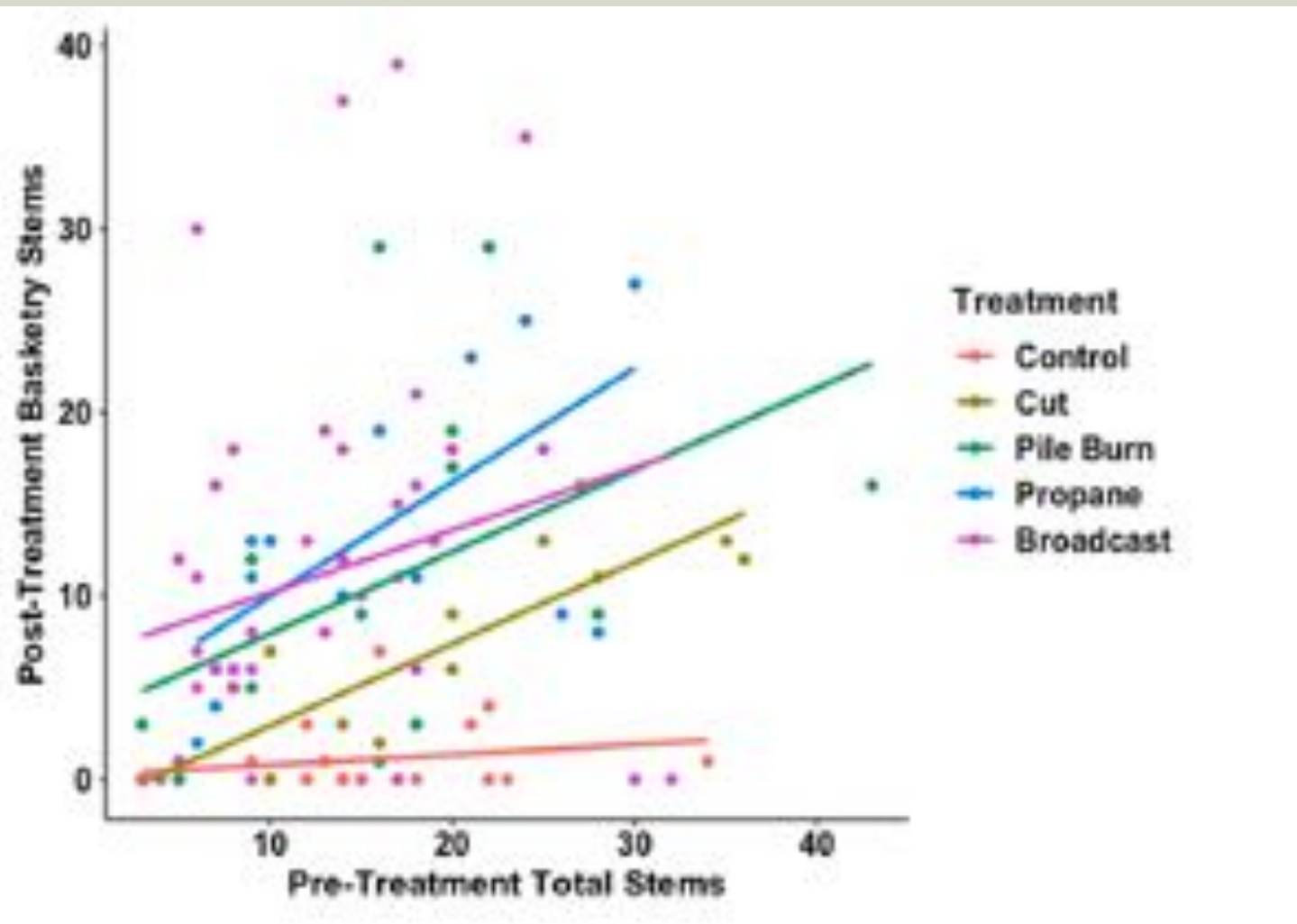
# HAZEL FOR BASKETRY ALONG EMERGENCY ACCESS ROUTES, WILDLAND-URBAN INTERFACE (WUI), FUEL BREAKS/FIRELINES, AND/OR DEFENSIBLE OR EASIER IGNITABLE LOCATIONS.

- Indigenous Fire Stewardship of hazel for basketry and nut production includes: Burning [spring or fall] to reduce filbert weevil and moth nut pests, this causes resprouting of stems, harvesting post-fire stems for basketry [12 to 18 months later], leaving non-straight/useable stems and the lower pruned stems, remaining stems grow [years 1 to 5] increasing shrub stems to product hazelnuts, when nuts become more infested with pests, burn and re-start cycle.



## ANALYSIS AND RESULTS

- Through a mixed block design measuring pre- and post-treatment over 24 months on 91 shrubs in a 5 ha forest we found that all treatments significantly increased the density of viable basketry stems compared to control (untreated) shrubs ( $p < 0.001$ ), and that the prescribed broadcast fire treatment ( $p < 0.01$ ) and propane torch treatment ( $p < 0.1$ ) increased basketry stems compared to the cutting treatment. \*Aspect and Canopy (closure) were not a significant

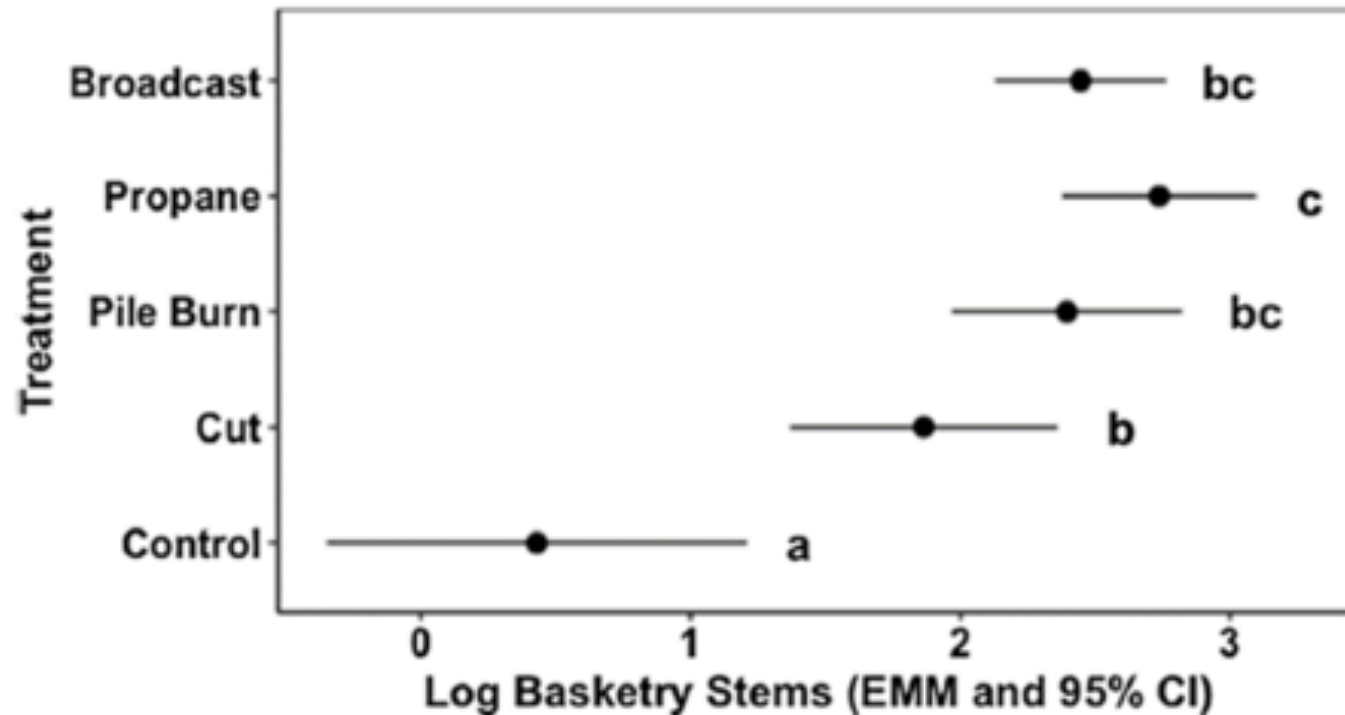


Fixed effect	$\chi^2$	Df	$p(>  \chi^2 )$
Treatment	35.38	4	< 0.001
Pre-treatment total stems	23.11	1	< 0.001
Aspect class	6.99	1	0.008
Canopy class	7.14	2	0.028

## ANALYSIS AND RESULTS

Effects of the fire proxy and broadcast burn treatments (e.g., cut, pile burn, propane, broadcast) on hazelnut basketry stem production compared with the untreated control. Estimated Marginal Mean (EMM) is back-transformed from the log scale and averaged over the values of aspect and canopy classes. The contrast to control ratio is the treatment EMM to untreated control EMM (1.54, SE = 0.60). The confidence intervals, *t*-statistic and *p*-values were generated using the Dunnett method.

Treatment	n	EMM	Contrast to control ratio	Contrast SE	CI	t ratio	p value
Cut	15	6.45	4.19	1.87	1.38–12.7	3.22	0.0066
Pile Burn	15	10.98	7.13	3.05	2.46–20.7	4.59	0.0001
Propane	15	15.45	10.05	4.16	3.57–28.2	5.57	< 0.0001
Broadcast	41	11.54	7.50	3.07	2.70–20.9	4.92	< 0.0001



Fire proxy treatment, broadcast burn, and untreated control effects on hazelnut basketry stem production. Estimated marginal means (EMM) of basketry stems with 95% confidence intervals (log scale) within the control and four fire proxy treatments. Letters indicate significant differences between treatments ( $p < 0.05$ ).

## ALIGNMENT OF PUBLIC AND TRIBAL FUELS REDUCTIONS, PRESCRIBED- CULTURAL BURNING AND RESOURCE OBJECTIVES

- Fuel reduction treatments can be modified to enhance culturally-important Indigenous resources while meeting fuel reduction objectives.
- Where California hazelnut is present and fuel reduction treatments are planned, a combination of these treatments could be applied, depending on the season and a land manager's objectives and resources.
- Such research and management can support tribal ecocultural revitalization, Indigenous Fire Stewardship and basketry-food traditions.



# CONCLUSIONS

- Where feasible and with higher density of California hazelnut shrub patches, fuels treatments and wildland fire management- both managing wildfires for achieving resource objectives for Cultural and Heritage interest, as well as with Prescribed/Cultural burning in strategically planned locations where tribes/community identifies priority areas to enhance basketry and food-nut opportunities.
- Increase collaborations with tribes can improve research opportunities and science applications for management.



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